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INVENTORS: Bryan E. Aupperle and Marcia L. Peters

APPARATUS AND METHOD FOR DETERMINING COMPATIBILITY OF WEB SITES WITH DESIGNATED REQUIREMENTS BASED ON FUNCTIONAL CHARACTERISTICS OF THE WEB SITES

BACKGROUND OF THE INVENTION

5   1.   Technical Field:

The present invention is directed to an apparatus and method for determining compatibility of web sites with designated requirements. More specifically, the present invention is directed to an apparatus and method for creating

10   and searching a database of web sites, identifying the functional characteristics of the web sites and typically enabled functions of client computers that make use of the

web sites, and using this database to determine compatibility of the web sites with designated requirements.

2. Description of Related Art:

With the rapid expansion of the Internet as a source of information and a medium for conducting business and other transactions, it has become more difficult to identify web sites and their functionality. In an attempt to alleviate the problem of identifying web sites, search engines have been developed that allow users to enter search terms which are used by the search engine to identify web sites in their database that make use of those terms as keywords. If the user structures his/her search terms appropriately, the user may be provided with a list of web sites that are of interest to the user, although such a list typically includes a large number of web sites that are not of interest to the user as well.

Search engines may be used to identify web sites that address certain subject matter. For example, if a user wishes to obtain information about leukemia, the user may enter the search term "leukemia" in a field of the search engine and be provided with a list of web sites that make use of this term and thus, are more likely than not to deal with this subject matter.

Search engines may also be used to identify web hosting providers with desired platform capabilities. For example,

if a user wishes to obtain information about hosting
providers whose platforms have a Linux version 4.2 operating
system, a CGI interpreter, SQL database software installed,
and redundant T3 links to the Internet backbone, one may

5 enter these search terms in a particular search engine that
specializes in this type of information, and get a list of
hosting providers meeting the search criteria, their contact
information, and prices.

Web sites deliver their content to web browsers using a

10 variety of techniques, running the gamut from the basic HTML
1.0 standard (RFC 1945), to optional plug-ins requiring that
browser add-on code be installed on the client in order to
view the enhanced content, to active scripting techniques
such as those described hereafter. The designer of web site

15 content may always safely assume that every web browser
supports the basic HTML standard. However, the user of a web
browser may choose not to install a specific plug-in or may
choose to disable active scripting or other optional browser
features. Thus some users choose to forego an enhanced

20 browsing experience for various reasons, including concerns
about security exposures. Those users who choose to forego
the enhanced browsing experience may miss information and
content that would otherwise be made available to them.

While search engines may be used to identify web sites

25 that address certain subject matter or have certain platform
capabilities, search engines do not have any ability to
perform searches of web sites based on the functional

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characteristics of the web sites, e.g., the types of browser plugin modules utilized by the web pages comprising a web site, whether and what type of active scripting is used within the web pages of a web site, and the like.

"Active scripting," as the term is used herein, refers to techniques such as JavaScript, Java, and ActiveX that download interpreted programming language statements or compiled bytecodes to a client workstation during the loading by a web browser of a specified web page. Such statements or bytecodes may be executed at the client workstation by an execution environment such as a JavaScript interpreter, a Java Virtual Machine, or a Microsoft Windows DLL ("dynamic link library"), respectively. The functions provided by active scripting technologies are typically used by web site designers to add interactivity and dynamic behavior to an otherwise-static web page.

In addition, to meet the varying security and privacy needs of users, browsers such as Microsoft's Internet Explorer allow an individual user to define specified "security zones" having different functional characteristics, such as disabling plug-ins, or disabling a particular active scripting technique. A user may associate a list of designated domain names with a given security zone. Thus when the user visits one of the designated domain names, the browser applies the user-defined properties of that "security zone." Ergo, the browser may disallow active scripting, plug-ins, cookies, forms, and so forth, with respect to

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specific web sites, on a site-by-site basis. As a result, any web content that is delivered exclusively using one of the techniques not supported or disabled by the browser would not be seen by the user of that browser.

For example, while active scripting offers many possibilities to the programmer and can make the user's web browsing experience more interesting, active scripting has sometimes been exploited by hackers as a way to deliver malicious software to a client workstation such as a Trojan virus program that allows a hacker to control the workstation remotely without the computer owner's knowledge and consent, invade the user's privacy by spying on personal information, or steal confidential data from the computer. Therefore some users choose to disable active scripting when accessing untrusted web sites, to reduce their exposure to security exploits of this kind.

Thus, it would be beneficial to have an apparatus and method for compiling information about the functional characteristics of web sites. It would further be beneficial to have an apparatus and method for determining the most probable client device enabled functions corresponding to the functional characteristics of the web sites in order to determine how information may be relayed to a user of the client device. It would also be beneficial to have an apparatus and method for determining the compatibility of web sites with designated requirements based on the functional

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characteristics of the web sites and the enabled functions of the client devices of the web sites' typical users.

SUMMARY OF THE INVENTION

5   The present invention provides an apparatus and method for creating and searching a database of web site functional characteristics to identify web sites that are compatible with designated functions. With the present invention, a database of functional characteristics is compiled and a search interface is provided.

10   By "functional characteristics" what is meant is the functions supported by the web site that require functions to be enabled by user client devices in order to output the content of the web site on the client device and/or receive input from the client devices directed to the web site.

15 These functions may be provided through the computer code of the web site, plugin modules used by the web site, third party web sites, applications resident on client devices, and the like.

      The database of functional characteristics may be

20   compiled in automatically, manually, or a combination of automatically and manually. In one preferred embodiment, the database of functional characteristics is compiled by generating a list of web sites and a list of functions that are to be tested. For each web site in the list of web

25   sites, each function in the list of functions is tested. By

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testing, what is meant is that the function in the client web browser is disabled and the web site content retrieved. An analysis is then made as to whether the expected content is received and output through the client web browser with the function disabled. The results of the testing are then stored in a database entry.

The database of functional characteristics compiled by the present invention may be searched by a search engine to identify web sites having, or not having, functional characteristics of interest. Through a search interface, a user may enter designations of the functional characteristics that the user is either interested in having or not interested in having in the resultant list of web sites.

Based on the user's designation of functional characteristics, the search engine associated with the search interface searches the database of web sites and identifies the web site entries in the database that are compatible with the designated functional characteristics. The search engine then provides a listing of these web site entries through a search output interface which may then be used by the user who requested the search. Other features and advantages of the present invention will be described in, or will become apparent to those of ordinary skill in the art in view of the following detailed description of the preferred embodiments.

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BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of

5   use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 is an exemplary diagram illustrating a

10   distributed data processing system in accordance with the present invention;

Figure 2 is an exemplary diagram illustrating a server data processing device in accordance with the present invention;

15   **Figure 3** is an exemplary diagram illustrating a client data processing device in accordance with the present invention;

Figure 4 is an exemplary diagram of a web site database entry according to the present invention;

20   **Figure 5** is an exemplary block diagram of a web site functional characteristic searching service provider according to the present invention;

Figure 6 is an exemplary block diagram of an automated web site database generation device according to the present

25   invention;

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Figure 7 is an exemplary diagram illustrating a search interface according to the present invention;

Figure 8 is an exemplary diagram illustrating a search output interface according to the present invention;

5   Figure 9 is a flowchart outlining an exemplary operation of the present invention; and

Figure 10 is a flowchart outlining an exemplary operation of the present invention when generating a web site functional characteristic database.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides an apparatus and method for compiling functional characteristic information about web sites. In addition, the present invention provides an apparatus and method for identifying web sites that have functional characteristics, and whose typical users' browsers have functional characteristics, that meet designated requirements.

The term "functional characteristics," as used in this 20   description, refers to one or more of the functions that may be performed via the web site or are supported by the web site, and the functions that are supported by the browsers of typical users of the web site, as opposed to platform characteristics. These functions may include, for example, 25   the ability to provide dynamic web page content, provide dynamic user interfaces, display digital movies, broadcast

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audio data, fill in forms, store cookies on the user's hard
drive, and the like, as well as provide specific types of
each of these functions.

The functional characteristics may be provided by web
5   application software on the server(s) hosting the web site
itself, middleware or platform software on the server(s)
hosting the web site, third party web sites, plugin modules
to the server(s) hosting the web site, data sent from the
server(s) hosting the web site to one or more of a browser
10   function, runtime environment, interpreter, compiler, browser
plugin module, platform function, dynamic link library (DLL),
operating system, application program, etc. resident on a
client computer, and the like.

For the purposes of this invention, there are two
15   relevant aspects to the web site's support of any given
functional characteristic. First, the functional
characteristic may require that certain software be installed
and resident and enabled on the web server(s) hosting the web
site. For example in order for a web site to deliver
20   streaming video using the Real Video technology, it must have
a Real Video streaming server component installed.

Second, making use of the functional characteristic to
deliver web content to an end user may require that web
browser clients visiting the web site also have particular
25   software installed and enabled on the client workstation.
Again using Real Video as an example, clients visiting the
exemplary web site would have to have the Real Video player

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installed and enabled, in order to view streaming video from a Real Video streaming server.

Simply determining that a given web site offers a particular functional characteristic is not sufficient. To a
5 web content creator, it is also important to know whether typical clients visiting that web site are likely to have a particular client-side component installed and enabled.

Today there is no standard way to determine, from a program resident on a web server, all the relevant functional
10 characteristics of clients typically visiting that web site. Certain specific functional characteristics can be determined by program logic, but others can only be determined by human inspection of web content delivered to a client workstation.

For example, if the client device has JavaScript
15 enabled, it is often possible, using JavaScript, for the web content creator to query the client's browser and determine its functional characteristics. However, JavaScript itself is one of the functional characteristics that may be disabled in the client's browser. The distinction between determining
20 programmatically and determining by human inspection of delivered content is illustrated in the following two examples.

For example, if the HTML file contains a SCRIPT tag such as the following:

25 <SCRIPT language="javaScript" SRC="ads.js"></script>

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then one may infer that the web page in question uses JavaScript to deliver its content. This tag causes the client's browser to make a separate HTTP request to the web server for an executable JavaScript file named "ads.js".

5   Subsequent statements in the web page may invoke functions defined in the downloaded JavaScript file, which are then executed locally on the client. However, this tag does not indicate whether the browser on the client device actually has JavaScript enabled.

10   If the web page designer has inserted a NOSCRIPT tag for display if the browser does not have JavaScript enabled, such as the following:

<NOSCRIPT>

Your browser has JavaScript disabled.
15   You need a JavaScript-enabled browser
to enjoy the features of this website.

</NOSCRIPT>

then one may infer that the web page designer intends for the functional content of the web site to be delivered only to
20   users who have JavaScript enabled, and thus that users with JavaScript disabled will not be able to view the web site's expected functional content. Moreover, these users are also unlikely to bookmark or return to the web site at a later time. In addition, from this tag a web content designer
25   could further infer that JavaScript may be used freely for adding additional content, for example advertising, to that particular web site.

As a further example, a web site www.maps.com may offer interactive maps to a user. The user may visit that particular web site expecting to obtain a map, to zoom and scroll the map in order to display a particular geographic

5   coordinates, and to print a set of driving directions. If the zoom, scroll and print functionality is provided using JavaScript, but the client has JavaScript disabled, then the user is unlikely to visit that particular web site more than once, because the web site's functional content is not

10 available without a JavaScript-enabled client.

Similarly, a book seller's web site www.buybooks.com may offer searching as the only way one may locate a particular book that the user wants to buy. In order to access the search function provided, the web site presents a form, and

15 the user enters the book name on the search form. However, forms support is another browser functional characteristic that may be selectively disabled by the user, perhaps because a concern for the potential security exposure of accidentally sending private information to an untrusted web site.

20 Therefore, if the only way to find a desired book on www.buybooks.com is to submit a form, but the user has forms disabled, then that user would be unlikely to visit www.buybooks.com again since there is no way for the user to buy a particular book without exercising the disabled search

25 function. A web content provider wishing to add content to that particular web site could therefore include forms as part of their content, and be confident that users of that

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site would not be barred from interacting with the forms
because of their choice of browser settings.

A <NOSCRIPT> tag such as the example above cannot be
interpreted programmatically with present technology, since

5   no standard dictates the format or content of the comment
within the tag. The comment is simply arbitrary human-
readable text. Thus its interpretation generally requires
inspection by a human. By extension, however, one may
envision how a sophisticated artificial-intelligence type

10   heuristic algorithm may be programmed to perform similar
probabilistic judgment functions as the human and thereby be
able to interpret the comment within the tag.

Another example of functional characteristics of a web
browser is provided below. This is JavaScript code that may

15   be embedded in a HTML page, that interacts with JavaScript on
a Netscape browser, to query the browser as to whether the
ShockWave plug-in is installed. If this code is present in
an HTML page, it may be assumed that the creator of the HTML
page intended that it be used with the ShockWave plug-in.

20   Thus, by identifying this code in the HTML page, one may
determine that the HTML page supports the functional
characteristic of using the ShockWave plug-in application.

```
<!--
var plugin = (navigator.mimeTypes &&
navigator.mimeTypes["application/x-shockwave-flash"]) ?
navigator.mimeTypes["application/x-shockwave-
flash"].enabledPlugin : 0;
```
25

```
if ( plugin &&
parseInt(plugin.description.substring(plugin.description.in
dexOf(".")-1)) >= 4 ) {

    // Check for Flash version 4 or greater in Netscape

    document.write('<EMBED src="t1.swf" quality=best
bgcolor=#6633CC ');

    document.write(' swLiveConnect=FALSE WIDTH=100%
HEIGHT=100%');

    document.write(' TYPE="application/x-shockwave-flash"
PLUGINSPAGE="http://www.macromedia.com/shockwave/download/i
ndex.cgi?P1_Prod_Version=ShockwaveFlash">');

} else if (!(navigator.appName &&
navigator.appName.indexOf("Netscape")>=0 &&
navigator.appVersion.indexOf("2.")>=0)){

    // Netscape 2 will display the IMG tag below so don't
write an extra one

    document.write('<IMG SRC="noflash.gif" WIDTH=550
HEIGHT=400 BORDER=0>');

}

//->
```

These various characteristics of the web site identify
the various types of functions that may be performed using
the web site, and by inference, the browser functional
characteristics that are likely to be supported, or not
supported, by typical users visiting that web site. Thus,
for the example given above, the web site may provide digital
movies, may provide dynamic user interfaces for communicating
with a user, and may provide music in the form of MP3 files.
The present invention provides a mechanism for determining

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what these functional characteristics are for a plurality of web sites and allows a user to search a database of these web sites to identify the ones in which the user is interested based on their functional characteristics.

5   The present invention may be implemented as a service provided to customers requesting identification of web sites that have functional characteristics of interest. In one embodiment, a customer may request identification of web sites having and/or not having certain functional

10   characteristics. This request may then result in a search of a database of web sites and their characteristics. Such a database may be created through use of a computing device, manually, or through a combination of manually and using a computing device. The results of the search may then be

15   provided to the customer in exchange for a fee.

In a first preferred embodiment, the compilation of the database is done automatically by a computing device, by successively querying a series of web pages, parsing the web pages, determining the functional characteristics of the web

20   pages, and logging the results in a database for subsequent querying. In a second preferred embodiment, the compilation of the database is done manually by a human being, by successively disabling a specific functional characteristic of a web browser, accessing one or more web pages, examining

25   the returned web pages, determining if the expected content was delivered despite the specific functional characteristic being disabled, and recording the results in a database. In

a third preferred embodiment, the compilation of the database
is done by first utilizing automatic methods of the first
embodiment, then subsequently utilizing manual methods of the
second embodiment to refine the logged results.

5   The steps of disabling and accessing may be automated,
with an intervening examining stage by a human being between
each successive performance of the disabling and accessing
steps. Furthermore the successive accessing of a list of web
pages can be done manually or automated.

10   It will be appreciated that there is considerable
latitude in the order in which these steps may be performed
and still produce the same results; all such equivalent
variations are within the spirit and scope of the invention.
For example a specific functional characteristic could be
15   disabled and a series of different web sites accessed and the
results logged; or a given web site could be tested while
successively disabling and enabling a list of functional
characteristics to be tested and the results logged.

The submission of a request for the service and eventual
20   return of search results may be facilitated in many different
ways including through human interaction, traditional mail
systems, through automated telephone based systems, through a
computer network, and the like. The preferred embodiment of
the present invention makes use of computing devices to both
25   receive the request and process the request to thereby
perform a search and provide the results to the customer.
Although the preferred embodiment makes use of computing

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devices to both receive and process the search request, it should be appreciated that the present invention may be implemented as a human based method in which a computing device is only used to perform the actual search of the database.

In the preferred embodiment, the submission of the request, performance of the search and providing of the search results are performed in an automated manner. In this preferred embodiment, a user of a client device submits a request for a search of web sites having and/or not having particular functional characteristics using a search request interface of the present invention. The search request is then submitted to a service engine of the present invention which performs a search of web site entries in a web site database. The service engine then provides the results of the search to the requesting user. In addition, a payment and billing engine may be provided for requesting, obtaining, and verifying account information for payment of a fee for the service provided and eventual charging of the fee to the account submitted by the user.

Because the preferred embodiment of the present invention makes use of a distributed client/server computing system, the following is a brief explanation of the components of a distributed client/server computing system that may serve as an environment in which the present invention may be implemented. Although the preferred embodiment of the present invention will be described with

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reference to **Figures 1-3**, these figures are not intended to imply any limitations in the implementation of the present invention and many modifications may be made without departing from the spirit and scope of the present invention.

5   With reference now to the figures, **Figure 1** depicts an exemplary network of data processing systems in which the present invention may be implemented. Network data processing system **100** is a network of computers in which the present invention may be implemented. Network data processing system

10   **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers connected together within network data processing system **100**. Network **102** may include connections, such as wire, wireless communication links, or fiber optic cables.

15   In the depicted example, servers **104** and **105** are connected to network **102** along with storage unit **106**. The servers **104** and **105** are described in greater detail hereafter.

In addition, clients **108**, **110**, and **112** are connected to

20   network **102**. These clients **108**, **110**, and **112** may be, for example, personal computers, notebook computers, personal digital assistants (PDAs), cellular telephones, wireless two-way pagers, network computers, or any other computing device capable of communication via the network **102**.

25   In the depicted example, server **104** provides data, such as web pages and results of database queries, to clients **108**-**112**. Servers **105** are web servers hosting various web sites.

Servers **105** provide web pages and other data to clients **108-112**. Clients **108**, **110**, and **112** may be clients to servers **104-105**. Server **104** also may provide data about servers **105** to clients **108-112**. Network data processing system **100** may

5   include additional servers, clients, and other devices not shown. In the depicted example, network data processing system **100** is the Internet with network **102** representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another.

10   At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, educational and other computer systems that route data and messages. Of course, network data processing system **100** also

15   may be implemented as a number of different types of networks, such as for example, an intranet, a local area network (LAN), or a wide area network (WAN). **Figure 1** is intended as an example, and not as an architectural limitation for the present invention.

20   The server **104** may be used as a mechanism for providing the services offered by the present invention. As such, the server **104** may be equipped with software and hardware for implementing the functions of the present invention. For example, the server **104** may be provided with a software

25   application for providing a search interface through which a user may enter a search request, an application for performing the search of a database of web site functional

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characteristics, and an application for providing search results to the user. In addition, the server **104** may be provided with communication hardware for communicating with client devices via the network **102** and for retrieving information from a web site database stored on storage device **118**.

If a user wishes to identify web sites based on their functional characteristics and/or the functional characteristics of the browsers of typical clients visiting the web site, there currently is no mechanism for doing so. The present invention provides such a mechanism.

For example, advertisers may wish to identify web sites that have functional characteristics that will make the implementation of their advertisements on them easy and straightforward with minimal or no alteration of the advertisements required, or web sites whose functional characteristics will permit the use of streaming media to deliver more interesting advertising content. The present invention allows such advertisers to input functional characteristics that would make the implementation of the advertisements easy and straightforward, or to select web sites that will permit the use of desired functional characteristics in the advertising. The present invention then searches a web site database and returns a list of web sites that meet the functional characteristic requirements. Likewise, advertisers may wish to determine what functional characteristics are present in most web sites of interest.

With the present invention, database entries may be searched to determine which functional characteristics are most prevalent in the web sites, so they may tailor their advertising web content accordingly.

5   Moreover, a user may wish to avoid certain web sites that have particular functional characteristics. For example, if a user does not have a particular plugin module on his/her client device and does not wish to make use of the plugin module, the user may wish to avoid web sites that use

10   this plugin module. The present invention may then be used to identify web sites that lack this functional characteristic. There are a number of reasons why a user may wish to identify web sites based on their functional characteristics with the above being only some simple

15   examples.

With the present invention, a user of a client device, such as client device **112**, logs onto the service provider of the present invention provided on server **104**. The logging onto the service provider may be performed by entering a

20   Uniform Resource Locator (URL) of the web site on the server **104** using a web browser application resident on the client device, for example.

Once the client device **112** is in communication with the server **104**, the user may browse the contents of the web site

25   thereon. Within these contents is the ability to make use of a web site functional characteristics search engine of the present invention. In order to make use of this search

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engine, the user is provided with a search engine interface
through which the user may enter functional characteristics
that the user wishes to be supported by web sites returned in
the search results, and optionally, functional

5   characteristics of web sites that the user does not wish to
be supported by web sites returned in the search results.

The functional characteristics identified by the user
may be grouped together (i.e., specified) using well-known
Boolean operations such as "AND", "OR", "NOT" and the like.

10   By using the "AND" grouping, web sites that are returned in
search results must have both functional characteristics
identified. By using the "OR" grouping, web sites that are
returned in search results may have either functional
characteristic identified. The "NOT" grouping may be used to

15   designate a functional characteristic that the web site
should not have. Of course these groupings may be arranged
in any number of different ways to effect more complicated
searching of the web site database of the present invention.
Other functions of search engines as they are generally known

20   in the art may be included in the search engine of the
present invention without departing from the spirit and scope
of the present invention.

After receiving the user's input specifying functional
characteristics of interest, the search request is provided

25   to a search engine of the present invention. The search
engine of the present invention parses the search request and
searches an associated database of web sites and their

corresponding functional characteristics. The search engine
determines which of these database entries meets the
functional characteristics criteria designated by the user's
search request. The resultant list of web sites may then be
5   returned to the user by way of an output interface
transmitted to the user's client device.

As previously mentioned, the present invention may be
offered as a service to customers wishing to identify web
sites that have particular functional characteristics. As
10   such, users of the present invention may be charged a fee for
use. As a service, the present invention may further include
a billing system through which account information may be
solicited from a user, verified and stored for use in later
billing. Alternatively, web site owners may be charged a fee
15   for having their web sites included in the web site database
of the present invention.

In addition to the above, it should be noted that
another embodiment of the present invention may include a
combination of conventional text based search engines and the
20   functional characteristic search engine of the present
invention. For example, a conventional search engine or
metasearch engine, such as Yahoo™, HotBot™, Lycos™,
Webcrawler™, and the like, may be used to identify web sites
offering a particular subject matter. Thereafter, the
25   functional characteristic search engine of the present
invention may be used to search the search results identified
by the conventional search engine to determine which subset

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of these has functional characteristics of interest to the
user.

In such an embodiment, the search results returned by
the conventional search engine may be used to retrieve
database entries for these web sites from the web site
database. The retrieved entries may then be searched using
the functional characteristics search engine of the present
invention to determine which web sites meet the specified
functional characteristics criteria.

Figure 2 is a block diagram depicting a data processing
system that may be implemented as a server, such as server
104 in **Figure 1**, in accordance with a preferred embodiment of
the present invention. This server may be used by the
present invention as a mechanism for providing the web site
functional characteristic searching service provider.

As shown in **Figure 2**, data processing system **200** may be
a symmetric multiprocessor (SMP) system including a plurality
of processors **202** and **204** connected to system bus **206**.
Alternatively, a single-processor system may be employed.
Also connected to system bus **206** is memory controller/cache
208, which provides an interface to local memory **209**. I/O
bus bridge **210** is connected to system bus **206** and provides an
interface to I/O bus **212**. Memory controller/cache **208** and
I/O bus bridge **210** may be integrated as depicted.

Peripheral component interconnect (PCI) bus bridge **214**
connected to I/O bus **212** provides an interface to PCI local
bus **216**. A number of modems may be connected to PCI local

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bus **216**. Communications links to clients **108-112** in **Figure 1**
may be provided through modem **218** and network adapter **220**
connected to PCI local bus **216** through add-in boards.

Additional PCI bus bridges **222** and **224** provide
5   interfaces for additional PCI local buses **226** and **228**, from
which additional modems or network adapters may be supported.
In this manner, data processing system **200** provides multiple
network connections. A memory-mapped graphics adapter **230**
and hard disk **232** may also be connected to I/O bus **212** as
10   depicted, either directly or indirectly.

Those of ordinary skill in the art will appreciate that
the hardware depicted in **Figure 2** may vary. For example,
other peripheral devices, such as optical disk drives and the
like, also may be used in addition to or in place of the
15   hardware depicted. The depicted example is not meant to
imply architectural limitations with respect to the present
invention.

The data processing system depicted in **Figure 2** may be,
for example, an IBM e-Server pSeries system, a product of
20   International Business Machines Corporation in Armonk, New
York, running the Advanced Interactive Executive (AIX)
operating system or LINUX operating system.

With reference now to **Figure 3**, a block diagram
illustrating a data processing system is depicted in which
25   the present invention may be implemented. Data processing
system **300** is an example of a client computer. Data
processing system **300** employs a peripheral component

interconnect (PCI) local bus architecture. Although the
depicted example employs a PCI bus, other bus architectures
such as Accelerated Graphics Port (AGP) and Industry Standard
Architecture (ISA) may be used. Processor **302** and main

5 memory **304** are connected to PCI local bus **306** through PCI
bridge **308**. PCI bridge **308** also may include an integrated
memory controller and cache memory for processor **302**.
Additional connections to PCI local bus **306** may be made
through direct component interconnection or through add-in

10 boards. In the depicted example, local area network (LAN)
adapter **310**, SCSI host bus adapter **312**, and expansion bus
interface **314** are connected to PCI local bus **306** by direct
component connection. In contrast, audio adapter **316**,
graphics adapter **318**, and audio/video adapter **319** are

15 connected to PCI local bus **306** by add-in boards inserted into
expansion slots. Expansion bus interface **314** provides a
connection for a keyboard and mouse adapter **320**, modem **322**,
and additional memory **324**. Small computer system interface
(SCSI) host bus adapter **312** provides a connection for hard

20 disk drive **326**, tape drive **328**, and CD-ROM drive **330**.

An operating system runs on processor **302** and is used to
coordinate and provide control of various components within
data processing system **300** in **Figure 3**. The operating system
may be a commercially available operating system, such as

25 Windows 2000, which is available from Microsoft Corporation.
Application programs such as word processors, web browsers,
web browser plug ins, email clients and the like may run in

conjunction with the operating system and provide calls to the operating system applications executing on data processing system **300**. Instructions for the operating system and application programs are located on storage devices, such as hard disk drive **326**, and may be loaded into main memory **304** for execution by processor **302**.

Those of ordinary skill in the art will appreciate that the hardware in **Figure** 3 may vary depending on the implementation. Other internal hardware or peripheral devices, such as flash ROM (or equivalent nonvolatile memory) or optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure** 3. Also, the processes of the present invention may be applied to a multiprocessor data processing system.

As another example, data processing system **300** may be a stand-alone system configured to be bootable without relying on some type of network communication interface, whether or not data processing system **300** comprises some type of network communication interface. As a further example, data processing system **300** may be a Personal Digital Assistant (PDA) device configured with non-volatile memory such as ROM and/or flash ROM in which operating system files, application programs and/or user-generated data may be stored. Data processing system **300** also may be a notebook computer, hand held computer, kiosk or a Web appliance. The depicted example in **Figure** 3 and above-described examples are not meant to imply architectural limitations.

As noted above, the present invention provides a
mechanism through which a user may search for web sites
matching specified functional characteristics criteria.
Based on the search results of the present invention, the

5   user may determine whether to make use of one or more of the
web sites returned in the search results. The particular
search results returned are based on the entries in the web
site database.

Figure 4 is an exemplary diagram of a web site database
entry in accordance with the present invention. As shown in

10   **Figure 4**, the web site database entry **400** includes a web site
name field **410**, a web site Uniform Resource Locator (URL)
field **420**, and at least one of one or more active scripting
fields **440-450**, one or more plugin fields **460-470**, and one or

15   more other functional characteristic fields **480-490**. Of
course other fields may be included in addition to, or in
replacement of, the fields **410-490** depending on the
particular implementation without departing from the spirit
and scope of the present invention.

20   The database entries may be generated manually,
automatically, or a combination of manually and
automatically, depending on the particular embodiment of the
present invention. In a manual embodiment of the present
invention, a human user may use a web browser application to

25   retrieve web pages of various web sites, in a manner
generally known in the art. The human user may then examine
the web page to determine its functional characteristics and

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make note of them in a database entry such as that shown in **Figure 4**. Thus, for example, the human user may enter a URL for a web site, examine the returned web page to determine if it uses active scripting, the Shockwave™ plugin, Realplayer™,

5   or the like, and may then put identifiers in a database entry for this web site identifying the functional characteristics of the web site.

Such a manual method of generating the database may include disabling various functions of the web browser and

10   observing the information provided by the web page. This process may be interactively performed with different functions being enabled and disabled until a complete understanding of the functions of the web page is obtained. This understanding of the functions of the web page may then

15   be transcribed into a database entry that may be searched by a web site functional characteristics search engine of the present invention.

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In an alternative embodiment, an automated system may be used to retrieve web pages from various URLs and analyze the returned web pages. For example, an automated system may be provided that takes a list of domain names or URLs as input and sends a request for content to each successive domain name or URL on the list. Any returned web pages may then have their markup language (e.g., HyperText Markup Language (HTML), Extensible Markup Language (XML), Wireless Markup Language (WML), etc.) analyzed by the present invention to determine what functionality is provided by, required by and/or absent from the web page. For example, HTML tags may be examined to determine if a particular kind of active scripting is used, whether specific plugin applications are used, and the like.

The information obtained from the analysis of the web page code may then be used to generate a database entry. For example, the URL may be stored in field **420** and the identified active scripting may be stored in fields **440-450**. The name of the web page may be identified from a page name tag in the HTML code of the web page and then stored in the field **410**. Any plugin module support identified may be stored in the fields **460-470**. The resultant database entry may then be stored in the database storage device for optional refinement by a human user and later use by the functional characteristic search engine. Of course a combination of these two approaches may also be used without departing from the spirit and scope of the present invention.

Figure 5 is an exemplary block diagram of a web site functional characteristic searching service provider according to the present invention. The elements shown in Figure 5 may be implemented in software, hardware, or a

5   combination of hardware and software. In a preferred embodiment, the elements in Figure 5 are implemented as software instructions executed on processing hardware of a server apparatus.

As shown in Figure 5, the web site functional

10   characteristic searching service provider includes controller software residing in controller 510, a network interface 520, a search request input interface generation device 530, a search engine 540, a database interface 550, and a search results interface generation device 560. The elements 510-

15   560 are coupled to one another by way of control/data signal bus 570. Although a bus architecture is shown in Figure 5, the present invention is not limited to such and any architecture that facilitates the communication of control/data signals between the elements 510-560 may be used

20   without departing from the spirit and scope of the present invention.

The controller 510 controls the overall operation of the web site functional characteristic searching service provider and orchestrates the operation of the elements 520-560. The

25   controller 510 receives logon requests from client devices via the network interface 520. In response, the controller

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510 instructs the search request input interface **530** to
provide a search request interface to the client device.

The search request interface is then used by the user of
the client device to input and/or select the functional
characteristics that are of interest to the user. These may
include functional characteristics that the user wishes web
sites in the search results to have or not have. The user
then transmits back the search request generated using the
search request interface to the web site functional
characteristic searching service provider. The search
request is then provided to the search engine **540**.

The search engine **540** parses the search request and
performs a search of the web site database based on the
search request. The search engine **540** searches the web site
database via the database interface **550**. The search engine
540 compiles a list of web site database entries that match
the criteria specified in the search request and provides
this list to the search results interface generation device
560 which generates a search results interface and transmits
it to the client device from which the search request was
received.

Although not explicitly shown in **Figure 5**, as previously
described, the present invention may further include a
billing system. The billing system may be used to maintain
account information for users of the web site functional
characteristic searching service provider and provide a

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mechanism by which payment for use of the present invention may be obtained.

Figure 6 is an exemplary block diagram of a web site database generation device in accordance with the present invention. The elements shown in **Figure 6** may be implemented in software, hardware, or a combination of hardware and software. In a preferred embodiment, the elements in **Figure 6** are implemented as software instructions executed on processing hardware of a server apparatus.

As shown in **Figure 6**, the web site database generation device includes a controller **610**, a network interface **620**, a database interface **630**, a memory **640**, and a web site content analysis engine **650**. The elements **610-650** are coupled to one another via the control/data signal bus **660**. Although a bus architecture is shown in **Figure 6**, the present invention is not limited to such and any architecture that facilitates the communication of control/data signals between the elements **610-650** may be used without departing from the spirit and scope of the present invention.

The controller **610** controls the overall operation of the web site database generation device. The controller **610** operates based on control programs stored in, for example, memory **640**. Based on these control programs, the controller **610** queries web sites by sending out requests for content via the network interface **620**. The retrieved content, if any, is then analyzed to determine the functional characteristics of the web site. The web site information and functional

characteristic information may then be stored as an entry in the web site database via the database interface **630**.

Figure 7 is an exemplary diagram of a search interface according to the present invention. As shown in **Figure 7**, the search interface may be implemented as a dynamic web page downloaded to a client device, through which a user may specify a search request regarding functional characteristics criteria of web sites returned by the web site functional characteristic searching service provider of the present invention. Alternatively, the search interface may be implemented as a graphical user interface (GUI) resident on a client device. The particular implementation of the search interface may take various forms and the present invention is not limited to any one type of search interface.

As shown in **Figure 7**, the search interface includes a listing of functional characteristics **710** and a plurality of settings for each functional characteristic **720-740**. As previously mentioned, the functional characteristics **710** indicate functions supported by the web site and/or functions that are enabled on client web browsers. Such functional characteristics **710** may include, for example, active scripting, various plugin applications, and the like. In addition, the functional characteristics **710** may further include an ability to accept user specified tags to be searched for as either supported or not supported by web sites. In this way the user may define the type of

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functional characteristic searched for should the functional characteristic not be listed in the search interface.

In addition, functional characteristic grouping settings (Boolean operators) **750-760** are provided for indicating
5   groupings (specifying Boolean operations upon) of functional characteristics. These functional characteristic grouping settings provide a means for linking functional characteristics in much the same way as they are used in text-based searching.

10   Initially, the setting for each functional characteristic **710** is set to "not included" **720** meaning that the functional characteristic is not a basis upon which a functional characteristic search is to be made. In addition, initially the functional characteristic grouping settings are
15   all set to "AND". The user may, through a user interface, such as a pointing device, keyboard, or the like, associated with the client computer, change the settings **730-760** for search criteria specified by one or more of the functional characteristics **710** and the functional characteristic
20   groupings (Boolean operations).

For example, the user may select to include the functional characteristic of JavaScript active scripting by selecting the "HAVE" setting **730** associated with JavaScript and not include the functional characteristic of supporting
25   the Shockwave™ plugin application by selecting the "DOES NOT HAVE" setting **740** associated with the Shockwave™ plugin application. Alternatively, for example, the user may select

to search for web sites that either support JavaScript active scripting or the Shockwave™ plugin application. In order to do this, the user may select the "HAVE" setting **730** associated with JavaScript active scripting, select the "OR" **760** functional characteristic grouping setting (Boolean operator), and select the "HAVE" setting **730** for the Shockwave™ plugin application.

In addition to the functional characteristic search request settings described above, the search interface of the present invention may further include a conventional text search or keyword search request interface portion **770** through which a user may enter search terms or keywords in which the user is interested. The interface portion **770** may be an interface to an existing text or keyword search engine such as Yahoo™, HotBot™, Lycos™, Webcrawler™, or the like, or may be an interface to a text search engine integrated with the present invention.

Once the user has selected all of the functional characteristics, their groupings, and optionally any text search terms, the user may select the "SEARCH" virtual button to submit the search request to the web site functional characteristic searching service provider. The service provider will then parse the search request, perform the search indicated by the search request, and provide search results to the requesting client device using a search results interface.

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Figure 8 is an exemplary diagram illustrating a search
results interface according to the present invention. As
shown in Figure 8, the search results interface may include a
results portion 810 where the results of the search are

5   displayed. The results may include a listing of the web
sites identified and their respective functional
characteristics. In addition, the web site listing may
include a hyperlink to the web site, e.g., the URL for the
web site. The user may then select the hyperlink for a web

10   site from the list and be provided with the web site web
page. Other standard functions may be provided such as the
ability to save the listing of search results, printing the
listing of search results, and the like.

Figure 9 is a flowchart outlining an exemplary operation
of the present invention when performing a web site
functional characteristic searching service. As shown in
Figure 9, the operation starts with a logon request from a
client device (step 910). The logon request is verified
(step 920) and a web site functional characteristic searching

20   service interface is provided to the client device (step
930). The user of the client device uses this interface to
enter the functional characteristics to include in the search
and returns a search request which is received by the present
operation (step 940). The search request is parsed (step

25   950) and the search is conducted on the entries in the web
site functional characteristic database (step 960). The
results of the search are compiled and provided to the client

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device using a search results interface (step **970**).

Optionally, a billing system may then be used to charge the

user of the client device for use of the service. The

operation then ends.

Figure 10 is a flowchart depicting a method of obtaining

information with which to populate the web site

characteristic database. In the **Figure 10** example, all the

functional characteristics to be tested are tested for a

given web site before testing the next web site, although the

sequence of operations could be altered without departing

from the intent of the present invention. A list of web

sites (domain names) or web pages (URLs) to test for their

functional characteristics is created (step **1010**) and a list

of functional characteristics to test is created (step **1020**).

The next web site or web page to be tested, from the list

generated during step **1010**, is determined (step **1030**). The

list of functions under test generated during step **1020** is

initialized (step **1040**).

The next function in the list of functions is disabled

for testing purposes (step **1050**). All other functions are

enabled, in order to reveal the effects of just the function

under test. Disabling the next function in the list of

functions is not a mandatory step and may be optional

depending on the particular embodiment chosen. For example,

in a fully automatic embodiment, disabling a function may not

be necessary since only the code of the received content is

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analyzed to determine the functional characteristics of the web site.

The client performing the test makes an HTTP request to the specified web site to obtain the specified web page (step 1060) and receives the reply. It is determined whether the web site delivered the expected content (step 1070). Step 1070 could be performed by a human being manually inspecting and analyzing the content in the manual embodiment, or by an automated program analyzing the markup language document in the automated embodiment, or a combination of the two in a hybrid embodiment. As a variant, step 1070 can determine whether the received web page matches the functional characteristic under test for certain functional characteristics where an analysis of mark-up language or inspection of the HTTP header sent by the web server provides a definitive answer.

The result is recorded in a database (step 1080). A determination is made as to whether more functions from the function list need to be tested (step 1090). If the result of this determining step is yes, then control passes to step 1050. If the result of this determining step is no, then control passes to step 1095.

In step 1095 it is determined whether there are more web sites and/or web pages to test, from the list of web sites and/or web pages. If the result of the step 1095 test is yes, then control passes to step 1020 where a list of functions for testing is again created. In some variant

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implementations, the same list of functions may be tested for
all web sites, in which case the result of the step **1095**
determination instead passes control to step **1030**. This
execution path is omitted from the **Figure 10** illustration for
the sake of simplicity.

If the result of the step **1095** test is no, then all web
sites and/or web pages have been tested and the operations of
Figure 10 conclude.

Thus, the present invention provides an apparatus and
method for determining the compatibility of web sites with
functional characteristic requirements specified in a search
request. In this way, a user may discern web sites based on
their functional abilities to deliver particular kinds of web
content using particular kinds of delivery mechanisms
supported by the typical clients accessing the web sites,
rather than just based on their subject matter.

It is important to note that while the present invention
has been described in the context of a fully functioning data
processing system, those of ordinary skill in the art will
appreciate that the processes of the present invention are
capable of being distributed in the form of a computer
readable medium of instructions and a variety of forms and
that the present invention applies equally regardless of the
particular type of signal bearing media actually used to
carry out the distribution. Examples of computer readable
media include recordable-type media, such as a floppy disk, a
hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-

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type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form

5   of coded formats that are decoded for actual use in a particular data processing system.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will

10   appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to

15   carry out the distribution. Examples of computer readable media include recordable-type media such a floppy disc, a hard disk drive, a RAM, and CD-ROMs and transmission-type media such as digital and analog communications links.

The description of the present invention has been

20   presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain

25   the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various

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modifications as are suited to the particular use
contemplated.